# METHOD OF SAMPLING AND TESTING
# MT 327-04
# MECHANICAL ANALYSIS OF EXTRACTED AGGREGATE
# (Modified AASHTO T 30)

## 1 Scope:

**1.1** This method of test covers a procedure for the determination of the particle size distribution of fine and coarse aggregates extracted from bituminous mixtures, using sieves with square openings.

## 2 Referenced Documents:

**2.1** ***MT Materials Manual:***
MT-303 - Sampling Bituminous Paving Mixtures
MT-322- Method of Test for Quantitative Vacuum Extraction of Bituminous Mixtures
MT-405 - Sieves for Testing Purposes
MT-417 - Reducing Field Samples to Testing Size

## 3 Apparatus:

**3.1** *Balance* - The balance or scale shall have a capacity commensurate with the size of the sample being tested. The balance or scale used for weighing coarse material (plus 4 mesh) shall have a sensitivity of 0.1 pounds or 50 grams. The balance or scale used for weighing fine material (minus 4 mesh) shall have a sensitivity of 0.005 pounds (2.25 grams) for Central Laboratory testing and a sensitivity of 0.01 (4.5 grams) for job-site testing.

**3.2** *Sieves* - The sieves with square openings shall be mounted on substantial frames constructed in a manner that will prevent loss of material during sieving. Suitable sieve sizes shall be selected to furnish the information required by the specifications covering the material to be tested. The sieves shall conform to the requirements of MT-405, Wire Cloth Sieves for Testing Purposes.

**3.3** *Container* - A container sufficient to contain the sample covered with water and to permit vigorous agitation without inadvertent loss of any part of the sample or water. The container used shall be approved by the District or Area Materials Supervisor prior to use. (A suggested container would have a rounded bottom with a diameter of approximately 8 inches and a height of approximately 6 inches.)

**3.4** *Oven* - The oven shall be capable of maintaining a uniform temperature of 230 ± 9°F (110 ± 5°C).

## 4 Sample:

**4.1** The sample shall consist of the entire lot or sample of aggregate obtained according to Sections 3, 4 and 5 of MT-322, Test for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures from which the bituminous material has been extracted. (Note 1)

*Note 1 - A sample that is overloading screens will have to be split or quartered in accordance with MT-417, Reducing Field Samples to Testing Size, and graded separately and the weights combined to obtain a representative gradation.*

## 5 Procedure:

**5.1** The sample shall be dried until further drying at 110 ± 5ºC (230 ± 9ºF) does not alter the weight 0.1 percent, the precision of weighing. The total weight of aggregate in the bituminous mixture being tested is the sum of the weights of the dried aggregates and the mineral matter contained in the extracted bitumen. The latter is to be taken as the sum of the weight of ash in the extract and the increase in weight of the filter element as determined in MT-322.

**5.2** The test sample after being dried and weighed shall be placed in a container and covered with water. Add a sufficient amount of wetting agent (Note 2) to assure a thorough separation of the material finer than the 200 mesh from the coarser particles. The contents of the container shall be agitated vigorously and the wash water immediately poured over a nest of two sieves consisting of a 10 or 16 mesh sieve superimposed on a 200 mesh sieve. The use of a large spoon to stir and agitate the aggregate in the wash water has been found satisfactory.

*Note 2 - Wetting agents may include any dispersing agent such as Calgon, Joy or other detergent, or a soap, which will promote the separation of fine material.*

**5.3** The agitation shall be sufficiently vigorous to result in the complete separation from the coarse particles of all particles finer than the 200 mesh sieve and bring them into suspension in order that they may be removed by decantation of the wash water. Care shall be taken to avoid, as much as possible, the decantation of the coarse particles of the sample. The operation shall be repeated until the wash water is clear.

**5.4** All material retained on the nested sieves shall be returned to the container. The washed aggregate in the container shall be dried to constant weight at a temperature of 110 ± 5ºC (230 ± 9ºF) and weighed to the nearest 0.1 percent.

**5.5** The aggregate shall then be sieved over sieves of the various sizes required by the specification covering the mixture, including the 200 mesh sieve. The weight of material passing each sieve and retained on the next and the amount passing the 200 mesh sieve shall be recorded. The summation of these various weights must check the dried weight after washing within 0.2 percent of the total weight. The weight of dry material passing the 200 mesh sieve by dry sieving shall be added to the weight of mineral matter in the bitumen and the weight removed by washing in order to obtain the total passing the 200 mesh sieve. If it is desired to check the weight of material washed through the 200 mesh sieve, the wash water may be evaporated to dryness or filtered through a tared filter paper which is subsequently dried and weighed. The weights of fractions retained on the various sieves and the total passing the 200 mesh sieve shall be converted to percentages by dividing each by the total weight of aggregate in the bituminous mixture from Section 5.1.

## 6 Calculations:

**6.1** Plus 4 Mesh Material - The individual weights retained must be converted to total weight passing each of the various sieves. The total weight passing is then divided by the total weight of the sample, multiplied by 100, which will result in the percent passing. (See page 3 of 4 for example.)

## 7 Report:

**7.1** The results of the sieve analysis shall be reported as the total percentages passing each sieve size and reported to the nearest whole number for all material coarser than the 200 mesh. The 200 mesh material shall be reported to one tenth of one percent. Percentages shall be calculated on the basis of the total weight of the sample, including any material finer than the 200 mesh sieve.

EXTRACTION WORKSHEET

Lab. Number:_____ Sample Number:_____Example_____ Date:_____

Termini:_____3/4" P.M.S. Gr. B_____

BEFORE EXTRACTING

A: 1407.6 Weight of Sample

B: 160.2 Weight of Pan

C: 13.0 Weight of Filter

D: 173.2 Weight of Filter and Pan

AFTER EXTRACTING

E: 1493.7 Weight of Sample, Pan, and Filter

F: 1493.7 - D: 173.2 = F: 1320.5 Weight After Extracting

A: 1407.6 - F: 1320.5 = G: 87.1 Weight of Asphalt

$$\frac{G: 87.1}{F + G\ 1320.5 + 87.1} (100) = H\ 6.19$$ Percent of Asphalt

Before Wash 1320.5 After Wash 1220.6 LBW. 99.9

| Wt. Retained | | Wt. Pass. | Percent |
|---|---|---|---|
| _____ | 1" | _____ | _____ |
| -- | 3/4" | 1320.5 | 100 |
| 57.4 | 1/2" | 1263.1 | 96 |
| 219.0 | 3/8" | 1044.1 | 79 |
| 359.7 | 4M | 684.4 | 52 |
| 225.7 | 10M | 458.7 | 35 |
| 169.6 | 40M | 289.1 | 22 |
| 189.2 | 200M | 99.9 | 7.6 |

Remarks:

All weights are in grams.

Percent of asphalt by total weight of mix.